

FY2020 R&D Strategy Briefing

October 13, 2020

FUJITSU
shaping tomorrow with you

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Fujitsu's R&D Strategy



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COO & CTO

Head of Global Solutions Business

Head of International Regions

Responsible for Japan Region

Chairman of Fujitsu Laboratories

- I am Hidenori Furuta, COO & CTO at Fujitsu.
- I would like to thank you all for taking time out of your busy schedules to attend this briefing on Fujitsu's research and development strategy.
- First, I would like to explain Fujitsu's overall R&D strategy.

Our purpose is to make the world more sustainable
by building trust in society through innovation



Our Purpose indicates why Fujitsu exists in society.

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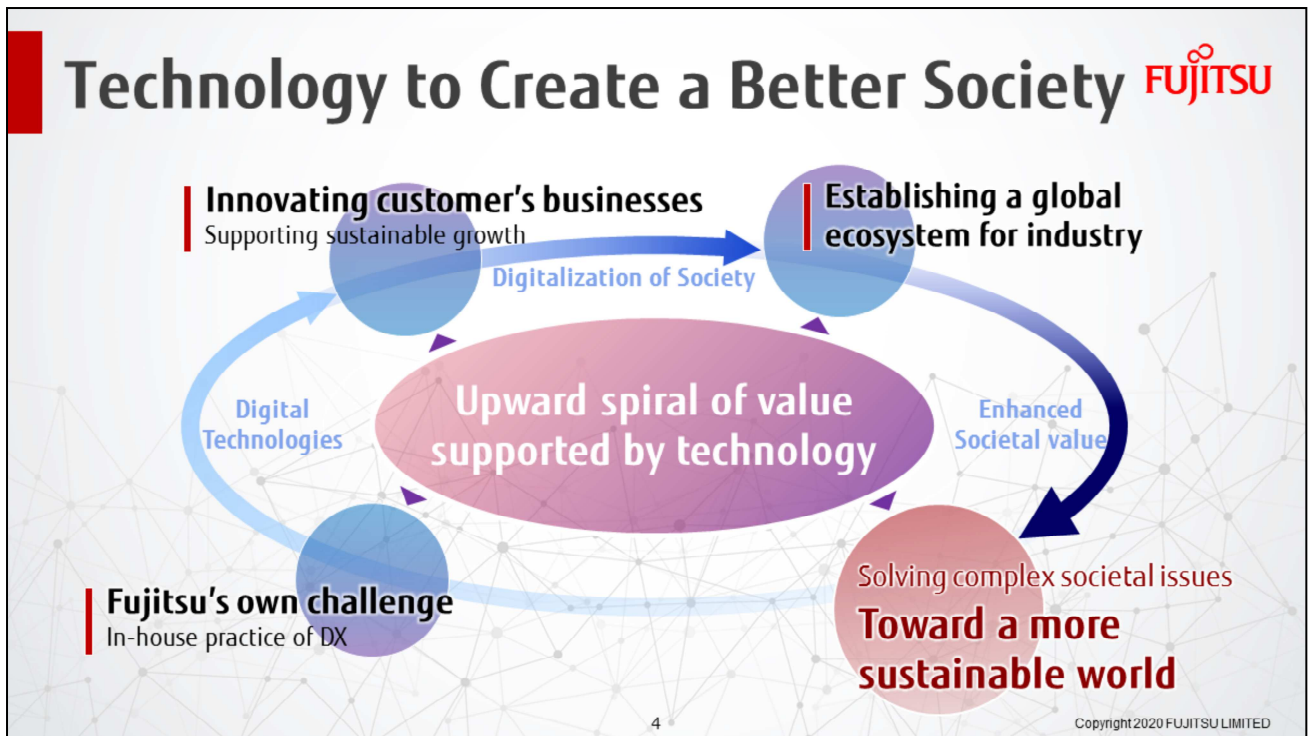
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- As global networks become ever more closely connected, and as data becomes connected in more complex ways, it is becoming increasingly necessary to build a society that offers people both high degree of peace of mind, and of convenience.
- This is also Fujitsu's ideal and goal as a digital transformation company.
- It is a significant role, one that only Fujitsu can play due to our experience in a wide range of industries.
- This year, Fujitsu set forth our new statement of Purpose.
- Fujitsu's Purpose is to make the world more sustainable by building trust in society through innovation.
- All of our business activities are being positioned as activities to achieve this purpose.



- Furthermore, we have also updated the Fujitsu Way, a set of fundamental principles for all Group employees, for the first time in 12 years.
- This new Fujitsu Way consists of three elements, with our Purpose at the center, which is the reason for the Fujitsu Group’s existence in society, then the values we cherish, and then the code of conduct, which consists of fundamental principles for our employees’ individual actions in their day-to-day activities.
- The Fujitsu Group is working to achieve our Purpose by advancing corporate activities with this Fujitsu Way as a new foundation for the activities of our employees.

Technology to Create a Better Society **FUJITSU**



- I believe that technology has the power to significantly transform business and society.
- At Fujitsu, we aim to further raise our unique technical capabilities, and provide even greater value to society.
- To achieve this, we are taking on the challenge of our own digital transformation. Moreover, we are also working with our customers as a partner in digitally transforming their businesses, in order to establish ecosystems that connect wide varieties of companies across industry boundaries.
- Through technological research and development, Fujitsu is supporting an upward spiral that generates social value. As we do so, we are contributing to making the world more sustainable, resolving the many social issues that persist throughout the world.

Focusing on 7 Key Technologies



- Last year, we laid out seven key strategic technologies we will focus on as core technologies supporting the creation of this sort of sustainable society. We are concentrating resources and investment on these core technologies, working on establishing strengths that are unique to Fujitsu.
- These various technologies are important even on their own, but combining them will provide even greater value to our customers.
- Now, I would like to introduce our main initiatives to strengthen our core technologies.

Computing

Providing the increasingly complex and vast enormous computing capabilities needed to solve a range of societal challenges

Compared with the stagnation of Moore's Law (refinement), the improvement in AI compute is enormous*

300,000 x Increase in 5 years

* Source: "AI and Compute", OpenAI
<https://openai.com/blog/ai-and-compute/>

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Innovation in Computing Technology

Fugaku
 4 world records
 Ranked No. 1 in the world for supercomputer performance

Digital Annealer
 Joint research in mid-molecular drug discovery (PeptiDream Inc.)

Quantum Computing
 Superconducting approach (RIKEN and University of Tokyo)
 Optical approach (Delft University of Technology)
 Quantum algorithms Error correction (Osaka University)
 Press release on Oct 13

Software Acceleration Technology

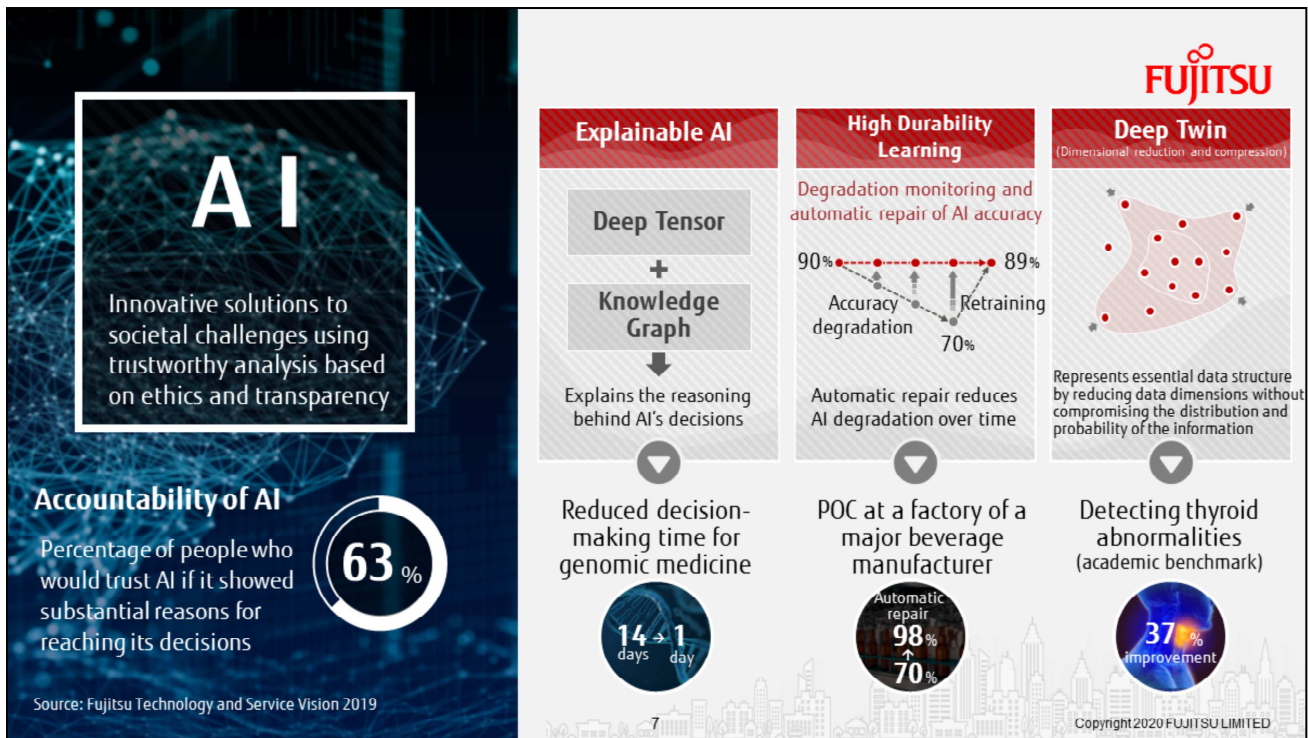
Content Aware Computing
 Automated control of AI calculation accuracy

Software technology that maximizes computer performance

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- In order to meet data and computation needs of ever-increasing scale and complexity, we must further accelerate the development of computing technology.
- In June, the Fugaku supercomputer, jointly developed by Fujitsu and RIKEN, achieved the world's highest ranking in four supercomputer benchmarks.
- Through the use of high performance computing and the Digital Annealer, we have developed techniques to dramatically shorten the drug discovery process for mid-molecular drugs.
- We are continuing research into quantum computing, as a technology that can transform the computing paradigm. We have begun joint research around the world with research institutions on the cutting-edge, and we aim to commercialize this research as soon as possible by strengthening our initiatives focused on medium- to long-term research.



- We are undertaking a number of different research efforts to create explainable AI, but as of right now, existing AI is not capable of providing substantive accountability.
- At Fujitsu, we have applied explainable AI technology to shorten the decision-making time for genomic medicine.
- For the High Durability Learning concept we announced last year, we have begun field trials of the technology in an anomaly detection system in a major beverage manufacturer's factory.
- In addition, we are also continuing our research efforts for DeepTwin technology, an AI-focused dimensional compression technology that resolves the "dimensional curse" that has plagued the field of AI technology for many years.

5G

Providing new value to everyone by connecting people with data and things in our complex and rapidly changing society

Global market forecast for Private 5G

Year	Solutions & Services	IoT devices	Infrastructure	Total
2020	0.1	1.2	0.1	1.4
2025	1.5	1.2	0.1	2.8
2030	5.9	4.8	0.1	10.8

2030 **10.8** trillion yen

Source: Japan Electronics and Information Technology Industries Association (JEITA) Summary of 2019 report on trends in sectors to watch



5G (Enterprise & Telcos) ●●●

Accelerate DX in vertically integrated organizations

- Establishment of 5G Vertical Service Office to consolidate Fujitsu's technological capabilities and knowledge
- Private 5G Partnership Program
- FUJITSU Collaboration Laboratory

Cloud Wireless Service

- Achieve seamless optimization from edge to cloud
- Managed service for license bands
- Covering everything from planning to operation
- Flexible software base stations

Beyond 5G 6G

- Support for larger capacity, multiple connections, and low latency
- Advanced information communication closer to human sensing
- Achieve advanced cyber-physical fusion

Opening of 5G base stations/ Global specifications

- Globally deployable O-RAN compliant
- Deployment results in domestic fields
- Under development in DISH Network

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- 5G is becoming a more important technology in the society of the new normal. As part of that, a new market is being created for private 5G, and this market is predicted to reach 10.8 trillion yen globally by 2030.
- At Fujitsu, we established a 5G Vertical Service Office in May to promote the expansion of DX business arising out of the use of 5G.
- As announced recently, we are enhancing initiatives aimed at co-creating solutions using Fujitsu's technology and insights, particularly with regard to 5G, as well as cutting-edge technology from partner companies, including Microsoft's Azure and IoT Edge, in order to transform customer operations and resolve issues. These programs include the Private 5G Partnership Program and the Fujitsu Collaboration Lab.
- Going forward, Fujitsu will continue to contribute to the development of 5G, as well as to the technological transformation for the 6G era.

Globally Unified Technology Strategy



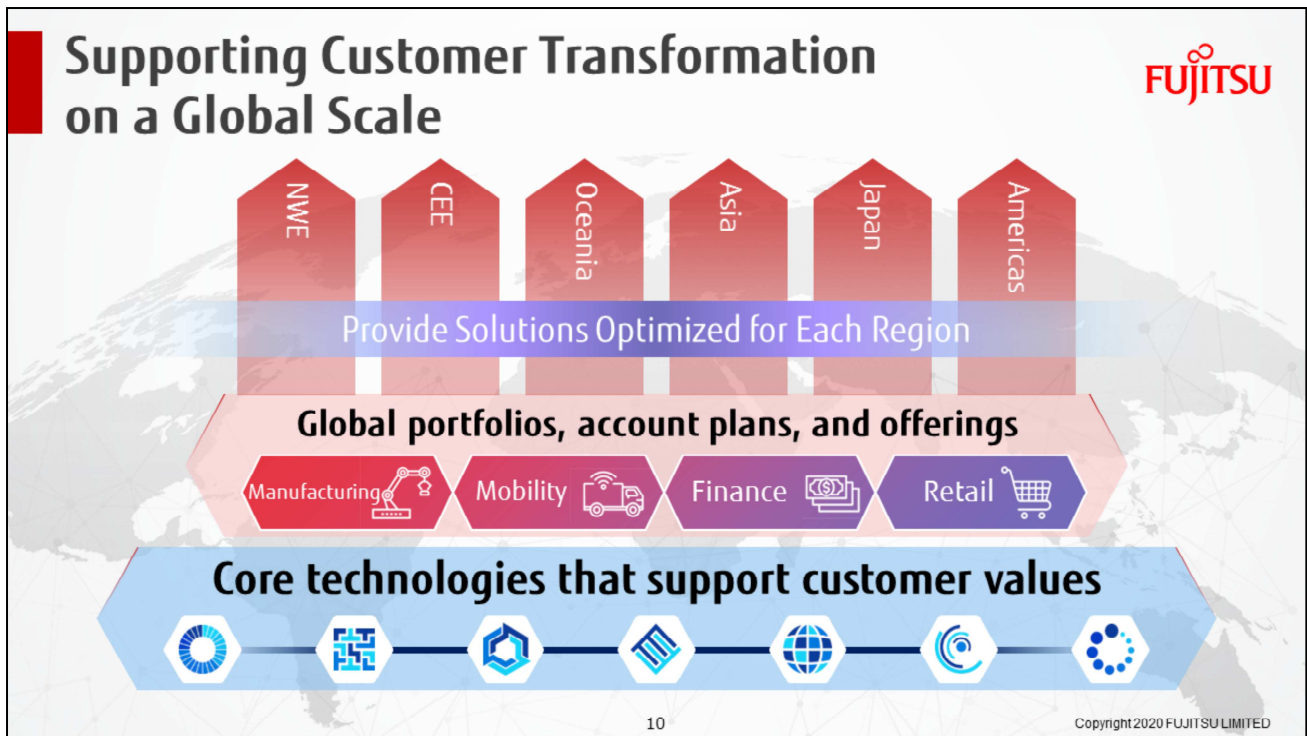
New CTO Structure
A stronger technology strategy for global markets

- ▶ Creating a global portfolio and regional portfolios
- ▶ Implementing regional technology strategies to meet specific market requirements

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- In order to pursue our strategy centered on these seven key technologies at a global level, we appointed CTOs for each region in March of this year.
- We are developing our technology strategy in accordance with regional needs and building our global portfolio, in order to further raise our technological potential in the global market.

Supporting Customer Transformation on a Global Scale



- For Fujitsu to be able to continue to grow as a DX company, we are pursuing an integrated business expansion in the global market with an approach based on shifting our business structure to services-oriented model
- In addition to reforming our organizational structure into six regions, including Japan, we are increasing the consistency of our global strategy across the entire Fujitsu Group, as well as the consistency of each region's business.
- With this new organization, we will accelerate the creation of global portfolios, account plans, and offerings while providing services optimized for each region.

Supporting Powerful Global Solutions

The image contains two infographic panels. The left panel, titled 'FUJITSU Work Life Shift', features a woman on a phone call. It lists 'Smart Working', 'Borderless Office', and 'Culture Change'. Below, it highlights 'Remote working technologies' (with icons for a house and a laptop) and 'Global strategic partners' (with icons for Microsoft, Citrix, VMware, and ServiceNow). The right panel, titled 'Mobility', shows a car and a truck. It lists 'Automobile insurance', 'Eco driving', and 'Connected car security'. Below, it highlights 'technology' (with icons for a globe, a network, and a car) and lists 'Digital Twin Analyzer', 'Digital Annealer', and 'V-SOC Upstream'.

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- I want to introduce four global solutions.
- Fujitsu Work Life Shift is a global service solutions we announced the other day that provides support for sustainable and diverse ways of working in the era of the new normal.
- Work Life Shift has been implemented internally for Fujitsu's 130,000 employees, and by using original Fujitsu technologies, such as Fujitsu Collaboration Space and Remote Virtual Environment Computing technologies we will provide this service to meet customer needs.
- In the area of mobility, we are providing platform technology that takes data gathered by connected cars and converts it into value.
- For example, with our Digital Twin Analyzer, which we announced in September, assessments of automobile accidents, which up to now have been subjective, can be automated based on images from in-vehicle cameras.
- In addition, in the field of security, we are collaborating with Upstream, an Israeli startup, to support the launch in the near future of Vehicle Operation Center.

Supporting Powerful Global Solutions

Monozukuri - Manufacturing

COLMINA Subscription Service
Cloud Robotics Service
PLM/MES linked offering

technology

Subscription based services technology

AI + Cloud Robotics factory automation technology

Retail - Digital Commerce -

Digital Commerce
Cloud Enterprise
Digital Managed Service

technology

Face + Palm vein hybrid authentication technology

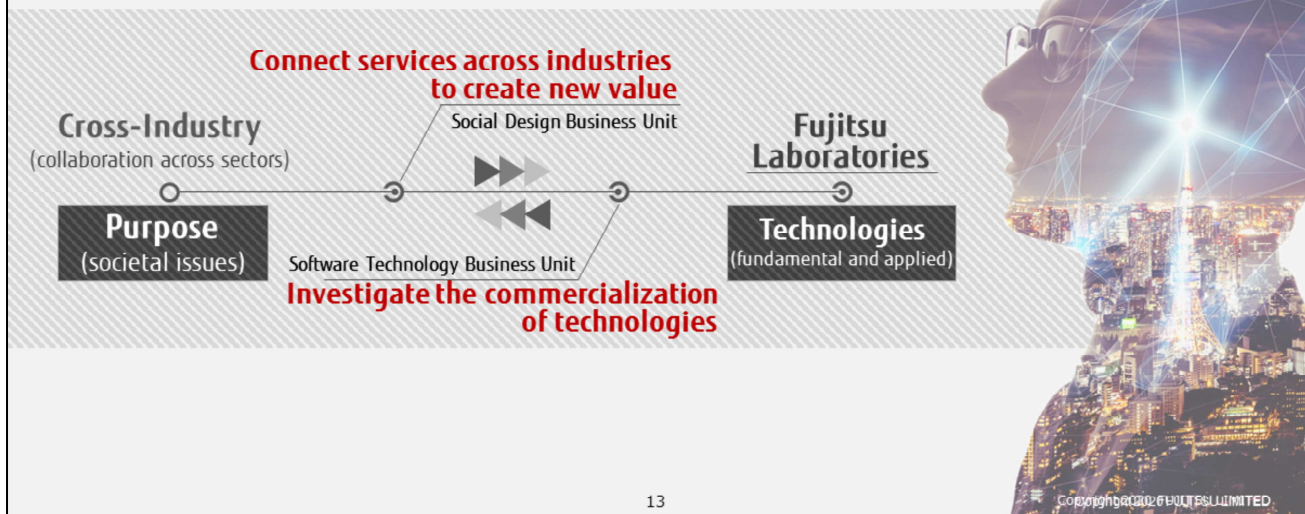
AI image recognition

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- The third solution is Monozukuri.
- By mainly using COLMINA, which is Fujitsu's intellectual property, and combining it with other technologies and services, we can bring efficiencies to the production operations of manufacturers, bring visibility to the operational status of production equipment, and bring a higher level of sophistication to maintenance and safety operations.
- By connecting data across the entire global supply chain, from design to production, it supports the acceleration of digital transformation in manufacturing by rebuilding the value chain, reproducing the manufacturing process in cyber space, and generating innovation through collaboration with diverse partners.
- The last solution is in the retail field, where there is an increasing need for contactless check-outs because of COVID-19.
- We plan to launch new offerings for the expanding digital commerce market by using technology that combines our facial recognition and palm vein authentication technologies, or using AI-based diagnostic imaging.

Promoting the practical application of technology



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- I would now like to talk about bringing technologies into practical application based on our DX business strategy.
- As we look to solve issues facing society and our customers, to put a variety of services and insights to work in developing new markets by creating new business value, we established the Social Design Business Unit.
- In addition, our Software Technology Business Unit brings together the internal and external technologies, including those developed by Fujitsu Laboratories, required to resolve issues and converts them into products or businesses, complete with quality assurance.
- With this process, it becomes possible to quickly commercialize technologies based on front-line needs.
- I want to give two examples of businesses developed using this process.

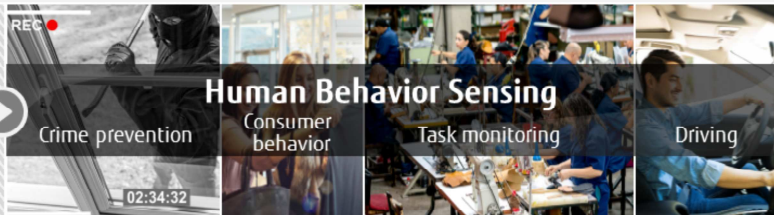
Accelerating Growth in DX Business



No.1 Accuracy

Behavioral Analysis Technology

Recognizes 100 basic actions



Human Behavior Sensing

Crime prevention

Consumer behavior

Task monitoring

Driving

Digital Annealer + Digital Laboratory Platform



Drug discovery and research

Joint research with PeptiDream Inc.

COVID-19

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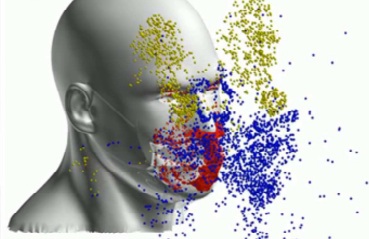
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- The first is human behavior sensing.
- The ability to recognize different types of movements and behavior offers the potential to resolve a wide variety of issues in areas including crime prevention, consumer behavior, task monitoring, and driver monitoring.
- Applying a technology developed by Fujitsu Laboratories that uses AI to recognize complex human behaviors from imaging data, Fujitsu hopes to quickly deploy these in front lines to boost monitoring and analysis capabilities. This is now leading to the development of a variety of new business opportunities.
- The second is drug discovery. For PeptiDream, identifying candidate compounds in the process of drug discovery previously required an enormous amount of time for processing huge volumes of data.
- Now, using the Digital Annealer and high-performance computing, identifying the structure of a drug can be achieved very quickly and with high precision.
- Rather than just using these technologies for research, as in these examples, we think it is important to apply them to services to drive innovation by our customers and resolve issues facing society.

Working to Overcome COVID-19

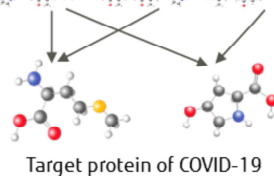
Predicting and controlling viral droplet infections

- Particles caught by mask
- Particles escaped from mask
- Particles that penetrated mask



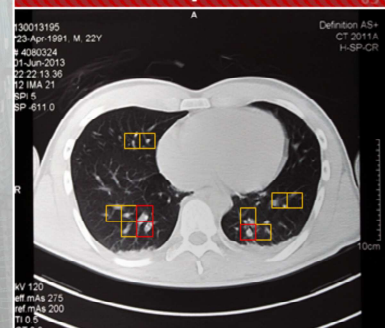
Identify candidate drugs

Over 2000 potential pharmaceutical drugs
1~2 years → 10 days



Target protein of COVID-19

Diagnostic support for COVID-19 pneumonia



video at left: PROVISION: (C) RIKEN, TOYOHASHI University of technology, Kobe University, COOPERATION: Kyoto Institute of Technology, OSAKA University, Dainippon Paper Corporation
background photograph: (C) RIKEN

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- Here are some examples that demonstrate how innovative technologies from Fujitsu are contributing to the fight against COVID-19, one of the world's most pressing problems today.
- To prevent the spread of infections, two examples illustrate how the Fugaku supercomputer is being leveraged in the fight against COVID-19 —one to perform droplet simulations of a person wearing a mask, and another to dramatically reduce the time required to identify treatment candidates from over 2000 potential drugs.
- The third example uses AI-based diagnostic imaging technology to diagnose COVID-19 pneumonia, thereby helping to reduce the burden on doctors making diagnoses.

R&D Approach for the Future

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'Selection & Focus' in R&D for transformation into a DX company

- ▶ Shift to a technology development model that enables the rapid creation of products and services through open technology development

Strengthen Strategy Research functions to realize strategic R & D through open technology development



R&D to create future paradigm shifts and innovation

- ▶ Continue the R&D of cutting-edge technologies to achieve a sustainable society, while at the same time promoting technology development to address the social risks posed by innovative technologies

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- Lastly, I would like to talk about our R&D approach for the future.
- Today, as digitization is accelerating around the world, an open innovation approach to technology development has become mainstream, and we are shifting toward a model in which we combine a variety of technologies to quickly create products and services.
- Fujitsu is seeking to transform itself into a DX company, and to effectively use technologies from inside and outside the company in open innovation, we need to strengthen the strategic function of researching and analyzing information about technology.
- We remain focused on R&D that further bolsters Fujitsu's strengths. Longer-term, basic research is performed by Fujitsu Laboratories. Using open innovation on a global basis, we are accelerating the process of bringing basic technologies into practical application.
- One of our aim is to contribute to strengthening the global competitiveness of Japanese technologies by conducting R&D in Japan.
- In areas including 5G or high-performance computing, for example, we need to develop our own strong technologies and integrate them into our business to stand up to leading competitors outside of Japan.
- Looking five or ten years into the future, we will additionally need paradigm-shifting technologies to generate innovation, as well as bring about a more sustainable society,
- Taking on the R&D challenges of technologies like quantum

computing or advanced AI represents a key mission for Fujitsu as a technology company.

- At the same time, to protect society from new risks that may arise from the emergence of revolutionary technologies, we will develop technologies to prepare for these risks.
- In light of these issues, we have changed our approach to Fujitsu's future R&D.

Computing

Fugaku, Digital Annealer, Quantum Computing, Content-Aware Computing

Hybrid IT

Auto Bug Detection/Fix, Hybrid Ops/AI Ops, CI/CD, Auto-Adjust Container Parameters

Data

Digital ID Tech., Connection Chain, Chain Data Lineage

IoT

Dracena, Real-time Digital Twin, MEC/Hyperconverged Edge, Human Sensing



5G

Private 5G, Software Base Station, Millimeter-Wave Radio, Optical Transmission, Next-Generation 6G

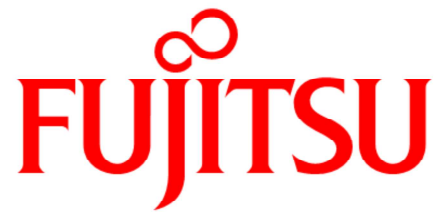
Cyber Security

Multimodal Biometric Authentication, AI for Security, Security for AI, Security by Design, Privacy Protection

AI

Behavioral Analysis Tech., Explainable AI, Trusted AI, AI×HPC, Topological Data Analysis, High-Durability Learning

- To achieve our Purpose and resolve issues facing society, Fujitsu is developing a variety of cutting-edge technologies to support our global offerings, and we will continue to work to develop and commercialize new technologies.



shaping tomorrow with you

- That concludes my presentation. Thank you for your attention.
- Now Hirotaka Hara, the CEO of Fujitsu Laboratories, will brief you on his organization's R&D strategy.